CLAIMS

1. A brazing sheet product comprising a core sheet, on at least one side of said core sheet a clad layer of an aluminum alloy comprising silicon in an amount in the range of 4 to 14% by weight, and further comprising on at least one outersurface of said clad layer a layer of nickel-tin alloy, such that the clad layer and all layers exterior thereto form a metal filler for a brazing operation and having a composition with the proviso that the mol-ratio of Ni:Sn is in the range of 10:(0.5 to 9).

2. A brazing sheet product according to claim 1, wherein the mol-ratio of Ni:Sn is in the range of 10:(0.5 to 6).

3. A brazing sheet product according to claim 1, wherein the layer of nickel-tin alloy is a plated layer.

4. A brazing sheet product according to claim 1, wherein the layer of nickel-tin alloy is applied via a technique selected from the group consisting of dipping, thermal spraying, chemical vapor deposition, physical vapor deposition.

5. A brazing sheet product according to claim 1, wherein the layer of nickel-tin alloy is essentially lead-free.

6. A brazing sheet product according to claim 1, wherein the layer of nickel-tin alloy has a thickness of at most 2.0μm.

7. A brazing sheet product according to claim 1, wherein the layer of nickel-tin alloy has a thickness of at most 1.0μm.

8. A brazing sheet product according to claim 1, wherein the layer of nickel-tin alloy has a thickness in a range of 0.1 to 0.8μm.

9. A brazing sheet product according to claim 1, wherein the layer of nickel-tin alloy has a thickness in a range of 0.25 to 0.8μm.

10. A brazing sheet product according to claim 1, wherein there is provided a layer comprising zinc as a bonding layer between the outersurface of the AlSi-alloy clad layer and the nickel-tin alloy layer.

11. A brazing sheet product according to claim 10, wherein the bonding layer has a thickness of at most 0.5μm.

12. A brazing sheet product according to claim 10, wherein the bonding layer has a thickness of at most 0.3μm.

13. A brazing sheet product according to claim 10, wherein the bonding layer has a thickness of in a range of 0.01 to 0.15μm.

14. A brazing sheet product according to claim 1, wherein the core sheet is made of an aluminum alloy.

15. A brazing sheet product according to claim 1, wherein the core sheet is made of an aluminum alloy selected from the group consisting of AA3xxx, AA5xxx and AA6xxx-series aluminum alloys.

16. A brazing sheet product according to claim 1, wherein the brazing sheet product has a post-braze corrosion life of 6 days or more in a SWAAT-test without perforations in accordance with ASTM G-85.

17. A method of manufacturing an Al or Al alloy workpiece, which method comprises the steps of:

(a) providing an Al or Al alloy workpiece,

(b) pre-treating of the outersurface of the Al or Al alloy workpiece, and

(c) plating a metal layer comprising nickel onto said outersurface of the Al or Al alloy workpiece, wherein during step (c) said metal layer comprising nickel is deposited by plating a nickel-tin alloy using an aqueous plating bath comprising a nickel-ion concentration in a range of 2 to 50 g/l and a tin-ion concentration in the range of 0.2 to 20 g/l.

18. A method according to claim 17, wherein during step (c) the electroplated layer has a composition such that the mol-ratio of Ni:Sn is in the range of 10:(0.5 to 9).

19. A method according to claim 17, wherein during step (c) the electroplated layer has a composition such that the mol-ratio of Ni:Sn is in the range of 10:(0.5 to 6).

20. A method according to claim 17, wherein taken together said aluminum base substrate and all layers exterior thereto form a metal filler for a brazing operation and having a composition comprising at least, by weight percent:

Si in the range of 5 to 12 %,
Ni in the range of 0.03 to 8%,
Bi in the range of at most 0.3%,
Sb in the range of at most 0.3%,
Sn in the range of 0.01 to 7%,
Zn in the range of at most 0.3%,
Mg in the range of at most 5%,
balance aluminum and inevitable impurities,

with the proviso that the mol-ratio of Ni:Sn is in the range of 10:(0.5 to 9).

21. A method according to claim 17, wherein the aqueous plating bath has a pH in the range of 6.5 to 9.0.

22. A method according to claim 17, wherein the aqueous plating bath has a pH in the range of 7.5 to 8.5.

23. A method according to claim 17, wherein the aqueous plating bath further comprises a pyrophosphate as a complexing agent in a range of 0.2 to 2 M/l.

24. A method according to claim 17, wherein the aqueous plating bath further comprises a further complexing agent in the form of an α-amino acid.

25. A method according to claim 17, wherein the aqueous plating bath further comprises a further complexing agent in the form of an α-amino acid in the form of amino acetic acid.

26. A method according to claim 17, wherein the layer of nickel-tin alloy has a thickness of at most 2.0μm.

27. A method according to claim 17, wherein the layer of nickel-tin alloy has a thickness of at most 1.0μm.

28. A method according to claim 17, wherein the layer of nickel-tin alloy has a thickness in a range of 0.1 to 0.8μm.

29. A method according to claim 17, wherein the layer of nickel-tin alloy has a thickness in a range of 0.25 to 0.8μm.

30. A method according to claim 17, wherein the workpiece is a brazing sheet product comprising a core sheet coupled on at least one surface of said core sheet to an aluminum clad layer, the aluminum clad layer being made of an aluminum alloy comprising silicon in an amount in the range of 4 to 14% by weight, and wherein during step (b) at least the outersurface of the aluminum clad alloy is being pre-treated.

31. A method according to claim 30, wherein the core sheet of the brazing sheet is made of an aluminum alloy.

32. A method according to claim 31, wherein the core sheet of the brazing sheet is made of an aluminum alloy selected from the group consisting of AA3xxx, AA5xxx, and AA6xxx-series aluminum alloys.

33. Method of use of an aqueous plating bath for manufacturing Ni-plated products for use in a fluxless CAB brazing operation comprising:

electrodepositing a layer of nickel-tin alloy on an Al or Al alloy workpiece within the aqueous bath, the aqueous bath having a pH in the range of 6.5 to 9.0, and comprising

(i) Ni ions in the range of 2 to 50 g/l.,

(ii) Sn ions in the range of 0.2 to 20 g/l,

(iii) at least one member of the group consisting of sodium pyrophosphate and potassium pyrophosphate thereof in the range of 0.2 to 2 M/l as a complexing agent,

(iv) a further complexing agent, and a balance of water.

34. Method of use according to claim 33, wherein the aqueous bath having a pH in the range of 7.5 to 8.5.

35. Method of use according to claim 33, wherein the pyrophosphate is present in a range of 65 to 650 g/l.

36. Method of use according to claim 33, wherein the pyrophosphate is present in a range of 100 to 350 g/l.

37. Method of use according to claim 33, wherein the further complexing agent is in the form of an α-amino acid.

38. Method of use according to claim 33, wherein the further complexing agent is in the form of an α-amino acid and wherein the α-amino acid is amino acetic acid.

39. Method of use according to claim 33, wherein the further complexing agent is present

in a range of 4 to 50 g/l.

40. Method of use according to claim 33, wherein the further complexing agent is present in a range of 5 to 40 g/l.

41. Method of use according to claim 33, wherein the aqueous plating bath is substantially free of lead ions.

42. An assembly of components joined by brazing, and wherein at least one said components being a brazing sheet product according to claim 1.

43. An assembly of components joined by brazing, and wherein at least one said components being the product obtained by the method according to claim 17.

44. An assembly according to claim 42, wherein the components are joined by means of a brazing operation in an inert atmosphere in the absence of a brazing flux material.

45. An assembly according to claim 42, wherein the components are joined by means of a brazing operation using a vacuum.

46. An assembly according to claim 42, wherein the parts made from said brazing sheet product have a post-braze corrosion life of 6 days or more in a SWAAT-test without perforations in accordance with ASTM G-85.

47. An assembly according to claim 42, wherein at least one other of said components comprises a material selected from the group consisting of steel, aluminized steel, stainless steel, plated or coated steel, plated or coated stainless steel, bronze, brass, nickel, nickel alloy, titanium, and plated or coated titanium.

48. An assembly according to claim 42, wherein the assembly is a heat exchanger for automotive application.

49. An assembly according to claim 42, wherein the assembly is a fuel cell.

50. An assembly according to claim 42, wherein the assembly is an electrochemical fuel cell.

51. An assembly according to claim 43, wherein the components are joined by means of a brazing operation in an inert atmosphere in the absence of a brazing flux material.

52. An assembly according to claim 43, wherein the components are joined by means of a brazing operation using a vacuum.

53. An assembly according to claim 43, wherein the parts made from said brazing sheet product have a post-braze corrosion life of 6 days or more in a SWAAT-test without perforations in accordance with ASTM G-85.

54. An assembly according to claim 43, wherein at least one other of said components comprises a material selected from the group consisting of steel, aluminized steel, stainless steel, plated or coated steel, plated or coated stainless steel, bronze, brass, nickel, nickel alloy, titanium, and plated or coated titanium.

55. An assembly according to claim 43, wherein the assembly is a heat exchanger for automotive application.

56. An assembly according to claim 43, wherein the assembly is a fuel cell.

57. An assembly according to claim 43, wherein the assembly is an electrochemical fuel cell.

58. A method according to claim 17, wherein the pyrophosphate is selected from at least one member of the group consisting of sodium pyrophosphate and potassium pyrophosphate.